Abstract View

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Coastal-Trapped and Frontal-Trapped Waves in a Baroclinic Western Boundary Current

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ABSTRACT

Four types of stable, subinertial Rossby-like waves have been found to propagate alongshore in a model baroclinic boundary current similar to the Gulf Stream as it flows along the continental margin of the southeastern United States. The two-layer model incorporates a general bottom topography with continental shelf and slope, and a thermal-wind mean current confined to the upper layer. The four wave components are the familiar continental shelf wave, the quasi-geostrophic edge wave and complementary mode edge wave, plus a new frontal-trapped wave, which has wave amplitude maxima within the cyclonic side of the Stream. The dispersion diagram for a particular topography/density/current setting may be interpreted as a composite of the four components' dispersion curve families. As in other similar problems a mode coupling between two components allows the characteristics of the two to be interchanged. The cases studied show the phase speeds of the various components to be affected by the location of the surface density front, the width of the continental shelf, and whether the inshore boundary is a vertical wall or a sloping beach. In general, the continental shelf waves (the quasi-geostrophic edge waves) are faster (slower) for a shelf with a coastal wall than for one with a sloping beach. The complementary mode edge waves and the frontal-trapped waves are fastest when the surface front is farthest from shore.